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(71) Applicants and
(72) Inventors: **HANSEN, Niels, Arpe** [DK/DK]; Grønlandsparken 88 C, DK-6715 Esbjerg N (DK). **HANSEN, Keld** [DK/DK]; Hovedgaden 63, DK-6621 Gesten (DK).

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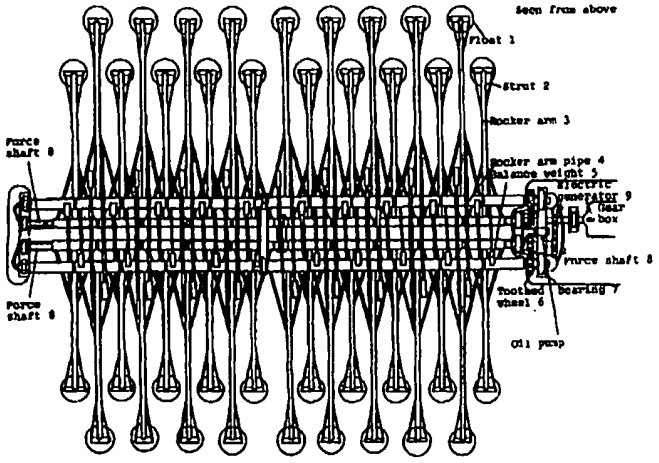
(54) Title: WAVEPOWERMACHINE



(57) Abstract: The wave force machine as such is constructed in such a way that it is capable of utilizing the upward force from the waves with (Fig. 1) the force from float (1) and rocker arm (3) via rocker arm pipe (4), wherein 1 or more lock bearings are provided, which transfer the upward force causing the driving force shaft (8) to rotate in the same direction. On each driving force shaft (8) may be one after the other of mounted float, rocker arm and rocker arm pipe with lock bearings after the other, and several driving force shafts (Fig. 6) (6.7,8 and 9) may be interconnected both horizontally and vertically to toothed wheel (1, 2, 3, 10, 11, 12, 13 and 14) shown here with 4 driving force shafts, but in principle any number of shafts may be interconnected. The total force from the driving force shafts may be brought to gearbox and electric generator and used in electricity production. 3 wave force machines may e.g. be interconnected to form e.g. a star, so that the force from 3 wave force machines may be gathered in the star point, wherein gearbox and electric generator are positioned,(cf. Fig. 9). Alternatively, several star points are interconnected, as shown in to from e.g. a hexagon.

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Wavepowermachine

The present invention relates to a wave force system comprising floats on rocker arms ending in rocker arm pipes, wherein lock bearings are provided, mounted on one or more force shafts attached to concrete pillar, boat or the like and interconnected to allow the total force to be transferred to gearbox and electric generator, for use in seas, lakes, oceans and other water reservoirs with upward and downward wave movements, the purpose of which being that the force shaft constantly rotates and transfers the force to gearbox and generator capable of producing electricity. Alternatively, the wave force machine may be equipped with blade arms Fig. 17. This model may be positioned in waters with much current, e.g. in Lillebælt, or in rivers or similar places.

The wave force machine comprises an electric hoist, wherein the electric motor of the electric hoist is activated from control box, the rocker arms being raised from the water either if the wind is too strong, the waves are too high, the water temperature is too low, the gear or generator temperature is too high, or during repairs of the wave force system or other things, and the wave force machine interrupts production.

The wave force machine may be set up on concrete blocks or adjustable feet at the bottom of the sea or may be mounted on a floating object (e.g. a boat), or the like.

In previous, known floats on rocker arms, this force was transferred to hydraulics, air pressure or filling of liquid. This invention gathers several floats and rocker arms and their upward force on one or more force shafts that is/are attached to concrete pillars, boat or the like, that rotate in the same direction as and are interconnected by means of toothed wheels.

Machine casing with toothed wheels, gearbox, control box and electric generator is watertight, as are all movable parts, between rocker arms. The toothed wheels placed at the end of the driving force shafts are also placed in a watertight casing.

According to the invention the wave force machine is characterised in that the floats attached to the rocker arms and ending in the rocker arm pipes, wherein the lock bearings are provided, are capable of transferring the upward force from the wave to the force shaft to make the latter turn. This downward movement is subject to free-wheeling.

The machine is constructed to be so long that it is situated over at least 2 waves, which means that floats are moving upward all the time causing the force shaft to rotate constantly.

The wave force machine is characterised in that one float on rocker arm and rocker arm pipe with lock bearings after the other may be placed on the same driving force shaft, and several systems of driving force shafts may be interconnected, and since the entire machine is so long that at least 2 wave crests are moving through the machine, this will cause the driving force shafts to rotate in the same direction all the time.

One or more driving force shafts can be interconnected both horizontally and vertically by means of toothed wheel on each wave force machine, and the total force can be utilized in gearbox and electric generator (Fig. 4). Four force shafts are shown in the drawing, but in principle six or any other combination of shafts can be provided.

Several wave force machines can be interconnected to form e.g. a star, in which the force shafts of the 3 wave force machines are joined and e.g. a gearbox and an electric generator are provided, or to form larger entities such as a hexagon (Fig. 20) or any other combination. By means of such combinations, reductions can be made with respect to concrete pillars, gearboxes and electric generators.

The electric hoist is also characterised in that when activated by a signal from the control box, the electric hoist can, by means of wires, raise the rocker arms from the water, a feature not seen previously, in order that the wave force machine is not destroyed during storm, ice formation or other conditions that would otherwise destroy the wave force machine. Simultaneously, the rocker arms can be raised from the water and the machine will stand still during e.g. repairs or service inspections.

The rocker arms are mounted with balance weight, allowing the entire buoyancy, and hence force, of the float to be utilized on the upward rocker arm. Free-wheeling occurs on the movement of the downward rocker arm.

When several wave force machines are interconnected to form e.g. a star or e.g. larger entities such as a hexagon or any other combination, a motor declutching of each force

shaft may be established in each centre of force, thus allowing the gearbox and electric generator to be declutched e.g. during repairs.

The wave force machine is provided with float, rocker arm and rocker arm pipe (Fig. 14), wherein rocker arm pipe is constructed in such a way that it is made up of 2 halves separable during e.g. repairs of driving force shaft, bearings or other things. Each bearing is also separable.

The wave force machine is constructed in such a way that one or more gear locking arms (Fig. 18) is/are provided within each rocker arm pipe, each gear locking arm being attached to driving force shaft 11. The gear locking arms engage with gear bush 8 that is attached to rocker arm pipe 2 which by means of groove with cotter 3 causes the driving force shaft to rotate in the case of upward wave movement, free-wheeling occurring in the case of downward movement.

The invention will be explained in greater detail below with reference to the drawings in which

Fig. 1 is a top view of the wave force machine, including floats, rocker arms, rocker arm pipes, driving shafts, balance weights, bearings, toothed wheels, oiling and shaft extending to gearbox and electric generator.

Fig. 2 is the wave force machine seen from one end, including electric hoist, balance weight, steel wire, shock absorber, floats, rocker arms and toothed wheels.

Fig. 3 is a side view of the wave force machine, including floats, rocker arms, balance weights, driving shafts, electric hoist, gearbox and electric generator.

Fig. 4 is a side view of the wave force machine, including a suggestion as to how the force from the driving shafts can be transferred to gearbox and electric generator.

Fig. 5 shows rocker arm, rocker arm pipe, driving shaft, one-way bearings, bracing, adjusting nylon washers and gasket between the rocker arm pipes.

Fig. 6 shows how the ends of the driving shafts are connected to toothed wheels in such a manner that the total force can be transferred to gearbox and electric generator.

Fig. 7 is a side view of the wave force machine, including a suggestion as to the positioning of gearbox and electric generator.

Fig. 8 is a side view of a rocker arm, including floats, fittings, rocker arm, shock absorber, strut for reinforcement, rocker arm pipe, one-way bearings and driving shaft.

Fig. 9 shows a suggestion as to how several wave force machines may be interconnected, seen from above.

Fig. 10 shows rocker arm pipes including oil canals, clipper seal protection cover, one-way bearings and gasket between two bearings.

Fig. 11 is a side view of the centre of force, including force shafts, toothed wheels and declutching system.

Fig. 12 is a side view of force shaft with cardan and motor for declutching.

Fig. 13 is a top view of the centre of force of the three interconnected wave force machines with declutchings.

Fig. 14 is a side view of rocker arm pipe, including rocker arm, balance weight, one-way bearings, groove, clipper seal protection cover, separable rocker pipe, gasket, oil canal and holes for oil passage.

Fig. 15 shows a float.

Fig. 16 shows a float with blade profile.

Fig. 17 shows wave force machine seen form one end mounted with floats mounted with blade profiles.

Fig. 18 shows rocker arm pipe with separable gear locking arms.

Fig. 19 shows wave force machines standing separately, forming a star and a hexagon.

Fig. 20 shows wave force machines connected to form a hexagon with a reduced number of concrete pillars, gearboxes and electric generators.

Fig. 21 shows wave force machines connected as star points next to each other in a long line.

Fig. 22 shows a rocker arm including float, rocker arm and arm with balance weight.

Fig. 1 is a top view of the wave force machine, including float 1, strut 2 for reinforcement, rocker arm 3, rocker arm pipe 4, wherein lock bearings are provided, balance weight 5, toothed wheel 6 interconnecting the force from the force shafts in such a way that the total force from the force shafts 8 can be gathered in gearbox and electric generator 9, 7 shows an ordinary bearing, wherein the force shaft runs. The drawing shows a wave force machine with 38 arms and four force shafts, but in principle the wave force machine may be connected to any number of floats, rocker arms and driving force shafts, and the floats 1 may in principle be designed in any manner.

Fig. 2 shows the wave force machine seen from one end, illustrating the hoist 1 with steel wire 3 and shock absorber 4. The electric hoist can be activated from control box receiving information if the wind is too strong, the waves too high, the water temperature too low or in the case of any other predetermined activation, and thus raise rocker arms 8 and floats 6 from the water, so that the wave machine stops and thus is not destroyed. The toothed wheels 7 situated at the end of each driving shaft are interconnected, so the total force can be transferred to gearbox and electric generator.

Fig. 3 is a side view of the wave force machine with hoist. In which control box 3 collects information from anemometer 1, sensor 4 air temperature, sensor 5 temperature for heat in gearbox and electric generator, sensor 6 wave height and sensor 7 water temperature. If the control box 3 receives a signal of a predetermined maximum setting, e.g. too high wind velocity, too low air temperature, too high waves, too low water temperature, too high temperature in the gearbox and electric generator, or any other predetermined signal, the control box will pass a control signal on to the electric hoist, wherein electric motor

8 is connected by toothed wheel 2 to the shaft 9 which will rotate and cause the wire 18 to wind onto the shaft 9, and the rocker arms 14 will be pulled out of the water and the wave force machine will stop and not be destroyed by waves too high or other predetermined natural conditions.

Fig. 4 is a side view of the wave force machine, wherein the forces are gathered in e.g. a star point with e.g. three wave force machines to a gearbox and electric generator 1 encapsulated in a machine casing and shown herein on a bedplate raisable by means of hydraulics. This system may be necessary if the wave force machine is set up in tidal areas.

Fig. 5. When the float attached to the rocker arm 5 is affected by a wave, the rocker arm 5 will move upward and cause rocker arm pipe 1, one-way bearings 3 and the force shaft 2 to rotate. Free-wheeling occurs when the rocker arm dives into the wave. Bracing 4 capable of receiving the transverse forces from the rocker arm 5 reinforces the rocker arm 5. To prevent water from flowing into rocker arm pipe 1 and one-way bearings 3, 2 adjusting nylon washers with gasket 6 are mounted between each rocker arm pipe 1.

Fig. 6 is a front and a side view of the shafts and toothed wheels of the wave force machine. And a top view. The 2 front view drawings show how the force shafts 6, 7, 8 and 9 are connected with toothed wheels 1,2,3,10,11,12,13 and 14. The wave force machine is shown here with 4 force shafts, but in principle it may be made up of any number of force shafts, both horizontally and vertically. The total force may e.g. be taken out on a force shaft and fed into gearbox 4 and on to electric generator 5. When the wave hits the float, causing the rocker arm to move upward, the various force shafts will rotate. And by interconnecting them by means of toothed wheels, the total force may be taken out and utilized in the production of electric. The drawing shows the top toothed wheel which has a somewhat lower rotation than the bottom toothed wheel solved by means of a gearing. In order to gather the force of the top shaft 6 and the bottom shaft 7, so that they rotate in the same direction, a toothed wheel 2 is provided between them. The same principle is applied to force shafts 8 and 9. Force shafts 7 and 8 are connected to the toothed wheels 13 and 14, and the total force is taken out on e.g. force shaft 8 to gearbox and electric generator.

Fig. 7 shows how gearbox 1 and electric generator 2 are placed in watertight machine casing 3. This is important in order to ensure that not toothed wheel, gearbox and electric generator are not destroyed by water, which is intake by fresh air intake piece 4.

Fig. 8 shows float 1 with fittings 2 and strut 8 and rocker arm 2 ending in rocker arm pipe 5 that is moved upward, when the wave hits float 1, together with rocker arm 2, causing rocker arm pipe to rotate lock bearings 4 into a tight position and the driving shaft 6 to rotate. Free-wheeling occurs when float and rocker arm dive into the wave. If the waves are too high, electric hoist and wire 9 are tightened and float and rocker arm are raised from the water, a shock absorber 3 being provided to relieve shock effects during raising and lowering.

Fig. 9 shows how several wave force machines may optionally be interconnected. Shown herein as a star which is in turn connected to another star. In principle, every wave force machine may be connected to form any combination. By connecting the machines in this manner, the entire system becomes less dependent on the direction of the waves. At the same time, reductions can be made with respect to gearbox, electric generator and concrete pillars. This renders the wave force machines more cost-effective.

Fig. 10 in order to make the spacing between each rocker arm pipe 5 watertight, it is necessary to place clipper seal 3 between one-way bearings 4 and gasket between bearings 6 and on top of rocker arm pipe 5 a protection cover 2 keeping out the water, the entire system now being sealed off from intrusion of water. For cooling there are oil canals 1.

Fig. 11 where the force shafts are joined in a centre of force, it is shown how each force shaft can be declutched, if e.g. a gearbox or electric generator is to be repaired or something else happens that necessitates declutching. By means of a motor for declutching 3, the force shaft 1 may be removed from toothed wheel 7. When the force shaft is to engage once again with toothed wheel 7, motor declutching 3 is relieved, and spring 4 will ensure that the force shaft 1 falls into place in toothed wheel 7, the entire system being protected against water by a motor room 2.

Fig. 12 force shaft with cardan joint and declutching. Toothed wheel 1, sliding bush 4 and spring 2 are mounted over sliding grooves 3, motor 7 providing for clutching and declutching. By means of the system, each wave force machine may e.g. be declutched. In

e.g. a large system with several gearboxes and electric generators, electric generators may be declutched as the waves diminish and the force from each individual wave force machine decreases, in order to continue the production of electricity, but with a smaller number of electric generators.

Fig. 13 shows a star point, shown herein with e.g. 3 wave force machines and 3 force shafts, cardan shafts 1,2 and 3, engaging with a common toothed wheel 4 capable of passing on the total force to gearbox and electric generator, everything being placed in a watertight machine casing 5.

Fig. 14 shows a rocker arm 8 with balance weight 9, including separable rocker pipe with protection cover 6, so that water cannot intrude. This system provides the feature that if e.g. one bearing breaks, it is not necessary to detach the entire driving shaft and the individual one-way bearings and rocker arms, but only to remove the defective rocker arm.

Fig. 15 shows a float utilizing the upward force from the wave in a better and more efficient way.

Fig. 16 shows a float, shown herein as a pyramid, on which, in this case, 3 blade profiles are mounted, but in principle any number of blade profiles may be mounted thereto. When the wave passes the float, an excess pressure will form above the blades, and this force will cause the float to move even more upward.

Fig. 17 shows the wave force machine provided with blade arms. Blade arms are intended to be used in waters with strong current, it could e.g. be in Lillebælt, a river bed or any other area of water current. The blades 1 function in the way that they can be turned upward or downward. This is controlled by means of a computer programme, so blades 1 are moving either upward or downward all the time.

Fig. 18 shows rocker arm pipes 2 with gear locking arms. The advantage of using gear locking arms is that ordinary ball bearings can be used, said ball bearings being separable in both ends of the rocker arm pipe, and that everything is separable and replaceable in the case of defects. The gear bush is divided into two pieces held in place by means of groove and cotter 3. The gear locking arms 7 function in the way that the gear arms 7 are attached to the through-going shaft 11. When the rocker arms 1 start moving up and

down, the gear arms engage with the gears of the two-piece gear bush 8 immediately, causing the shaft 11 to start to rotate. The teeth of the gear arm are positioned closer together than the teeth of the two-piece gear bush, providing a quicker firm grip, everything being operated in grease, which means that no maintenance is required.

Fig. 19 shows suggestions as to different ways of interconnecting the wave force machines. By e.g. interconnecting 3 wave force machines to form a star, it is rendered more independent from the direction from where the waves are coming. At the same time a gearbox and electric generator may be placed in the star point. This is a reduction of 2 gearboxes and electric generators, as opposed to each wave force machine being placed separately. At the same time the number of concrete pillars may be reduced. In the case of three separate wave force machines, 6 concrete pillars are used. By placing them to form a star, this number may be reduced to 3 concrete pillars, providing considerable cost-savings. As shown at the bottom of Fig. 19, 12 wave force machines may also, as shown herein, be joined to be interconnected, and the force is transferred to the 3 gearboxes 5 an on to electric generator 4. Only 12 concrete pillars are required in this shown situation. But in principle the wave force machines may be interconnected in any way and by use of any number of concrete pillars, gearboxes and electric generators.

Fig. 20 shows 12 wave force machines having 9 concrete pillars 3, 3 gearboxes 5 and 3 electric generators 4, resulting in a further reduction of concrete pillars and thus providing cost-savings and a more cost-effective production machinery. But in principle the wave force machine can be interconnected to form any combination.

Fig. 21 shows another way of interconnecting the wave force machines. But in principle they can be interconnected to form any conceivable combination.

Fig. 22 shows a rocker arm with float, rocker arm and arm with balance weight for balancing the weight on the float side, as the upward force increases and is utilized in a better way.

Claims

1. A wave force machine capable of utilizing the upward force from the waves by (Fig. 1), characterised in that the force from float/pontoon 1 and rocker arm 3 via rocker arm pipe 4, wherein 1 or more lock bearings are provided, which transfer the force to the driving force shaft 8.

2. A wave force machine according to claim 1 with (Fig. 1) rocker arms 3, characterised in that rocker arm 3 after rocker arm 3 may be mounted on said driving force shaft.

3. A wave force machine according to claims 1 and 2 with rocker arms (Fig. 6) 15, characterised in that two or more force shafts 6,7,8 and 9 are interconnected both horizontally and vertically to toothed wheel 1,2,3,10,11,12,13 and 14.

4. A wave force machine according to claims 1,2 and 3 with rocker arms, characterised in that several wave force machines may be interconnected to form e.g. a star (Fig. 9) or any other combination.

5. A wave force machine according to claims 1,2,3 and 4 with rocker arms, characterised in that several wave force machines with a star point may be e.g. interconnected to form a hexagon (Fig. 20) or any other combination.

6. A wave force machine having an electric hoist for raising rocker arms according to claims 1,2,3,4 and 5, characterised in that (Fig. 3) electric motor 8 with toothed wheel 2 transferring, when activated, the force to shaft 9, to which wires 18 are attached, and a shock absorber (Fig. 2) 4 being attached to the rocker arms (Fig. 2) 14 on the wave force machine.

7. A wave force machine according to claims 1,2,3,4,5 and 6 having rocker arms (Fig. 2) 8, characterised in that rocker arm 8 is mounted with balance weight (Fig. 2) 2, also illustrated (Fig. 14) by rocker arm 8 and balance weight 9.

8. A wave force machine according to claims 1,2,3,4,5,6 and 7 having rocker arms, characterised in that a control box (Fig. 3) 3 is mounted for controlling electric hoist, said con-

trol box including anemometer 1, sensor air temperature 4, sensor temperature gearbox and electric generator 5, sensor wave height 6 and sensor water temperature 7.

9. A wave force machine according to claims 1,2,3,4,5,6,7 and 8 having rocker arms, characterised by motor declutching (Fig. 11) 3 in the centre of force 3 on each force shaft 1,2,3.

10. A wave force machine according to claims 1,2,3,4,5,6,7,8 and 9 having rocker arms, characterised in that each float and rocker arm (Fig. 14) 8 with balance weight 9 has a separable rocker arm pipe 1.

11. A wave force machine according to claims 1,2,3,4,5,6,7,8,9 and 10 having rocker arms, characterised in that one or more gear locking arms (Fig. 18) 7 is/are provided within each rocker arm pipe, each gear locking arm being attached to driving shaft 11. The gear locking arms engage with gear bush 8 being attached in rocker arm pipe 2 by means of groove with cotters 3.

12. A wave force machine according to claims 1,2,3,4,5,6,7,8,9, 10 and 11 having rocker arms, characterised in that each float is a round buoy with a conical hopper (Fig. 8).

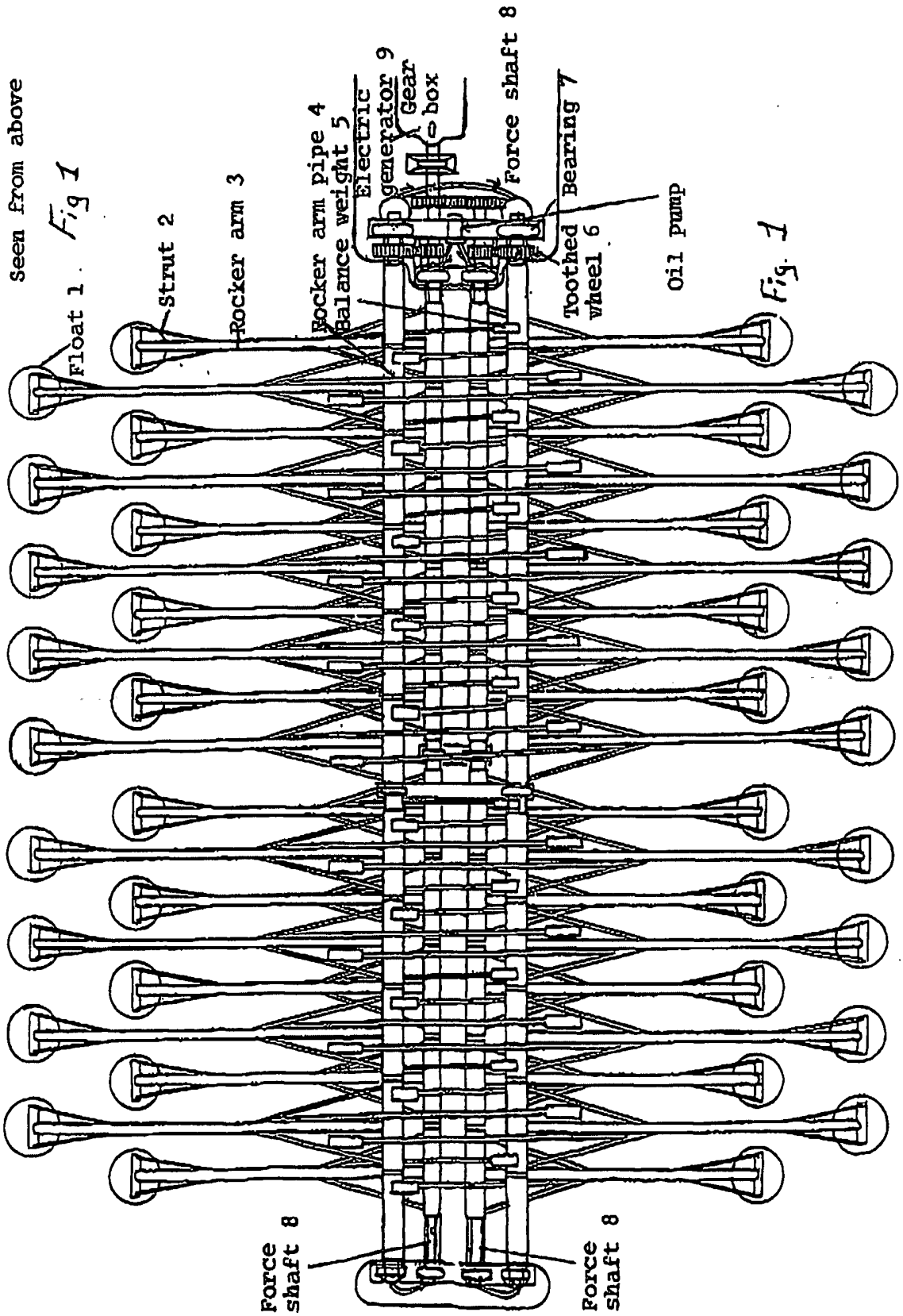
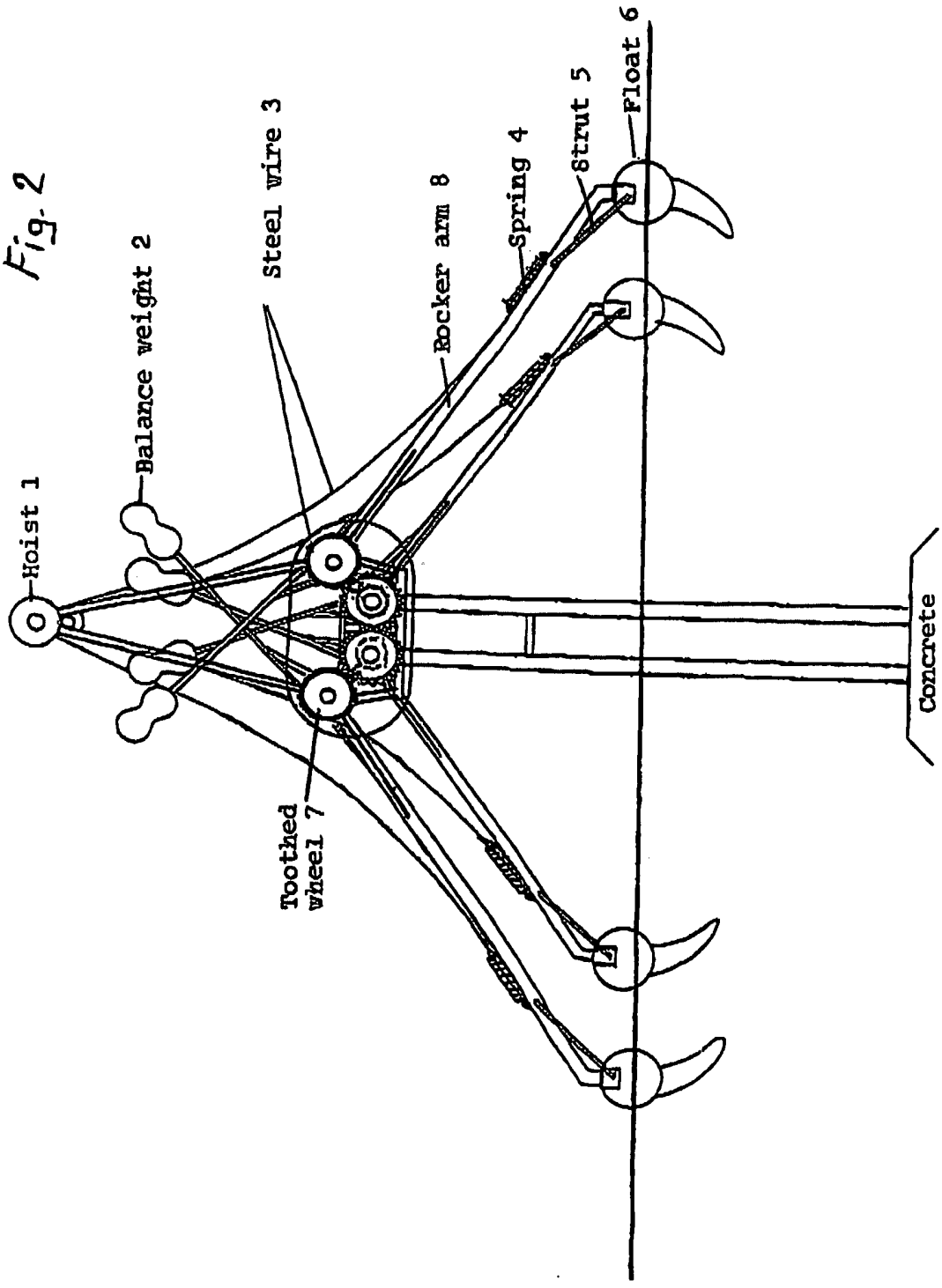

Seen from above
Fig 1
Float 1
Strut 2
Rocker arm 3
Rocker arm pipe 4
Balance weight 5
Electric generator 9
Gear box
Force shaft 8
Toothed wheel 6
Bearing 7
Oil pump
Force shaft 8
Force shaft 8
Fig. 1

Fig. 2


Hoist 1
Balance weight 2
Steel wire 3
Rocker arm 8
Spring 4
Strut 5
Float 6
Toothed wheel 7
Concrete

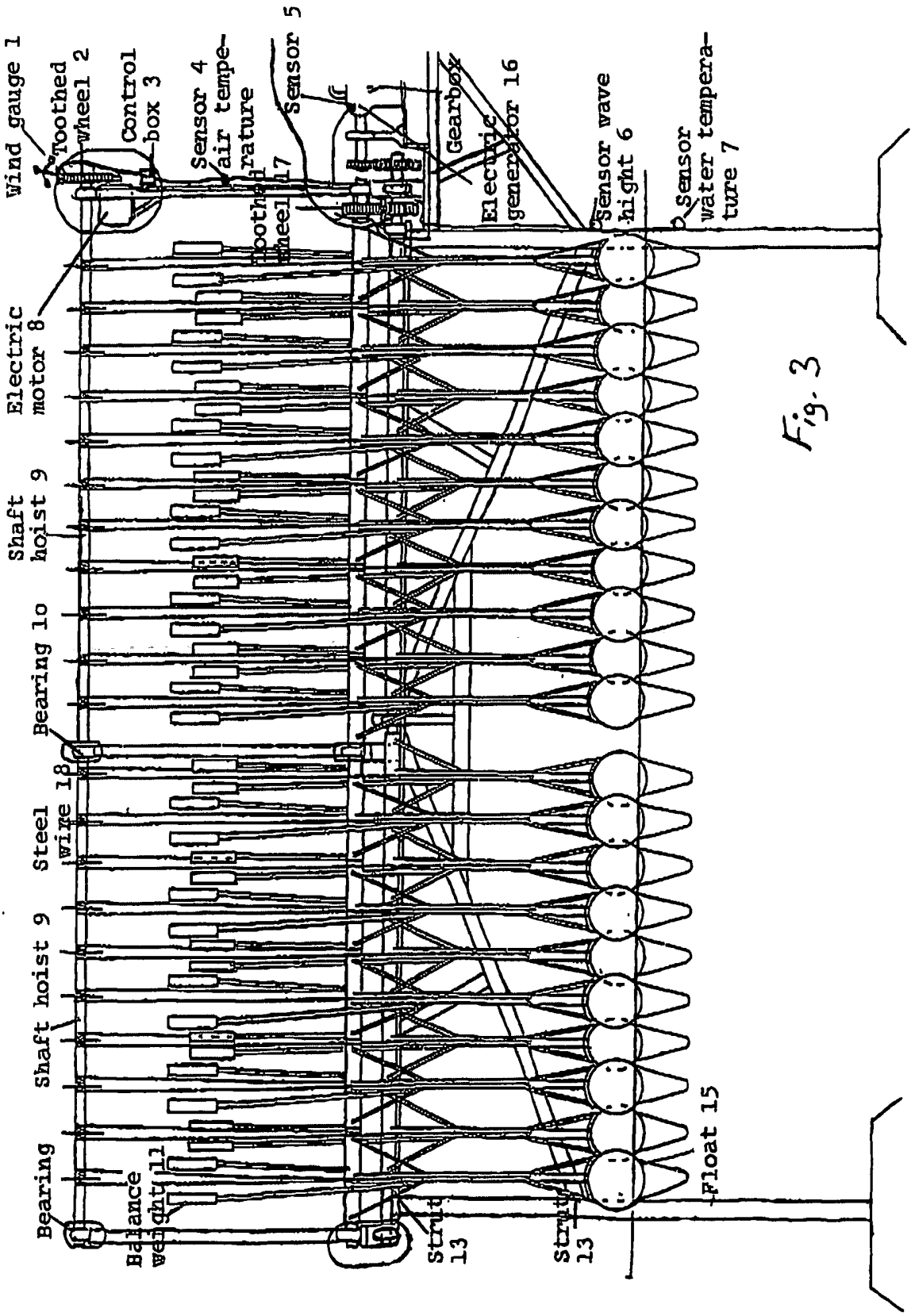
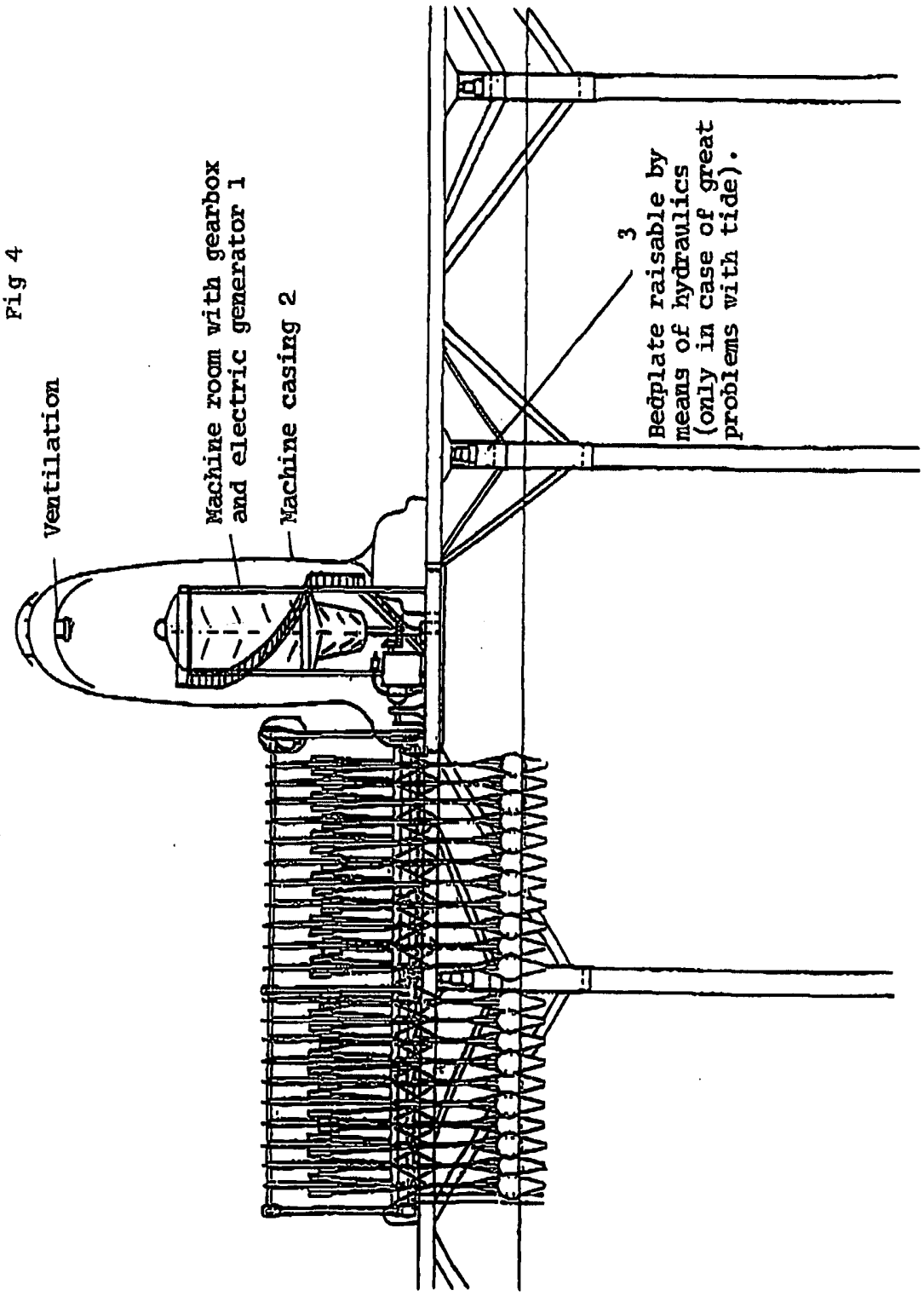

Wind gauge 1
Toothed wheel 2
Control box 3
Sensor 4 air temperature
Sensor 5
Toothed wheel 17
Gearbox
Electric generator 16
Sensor wave hight 6
Sensor water temperature 7
Electric motor 8
Shaft hoist 9
Bearing 10
Steel wire 18
Shaft hoist 9
Bearing
Balance weight 11
Strut 13
Strut 13
Float 15

Fig. 3


Side view
Fig 4
Ventilation
Machine room with gearbox and electric generator 1
Machine casing 2
3
Bedplate raisable by means of hydraulics (only in case of great problems with tide).

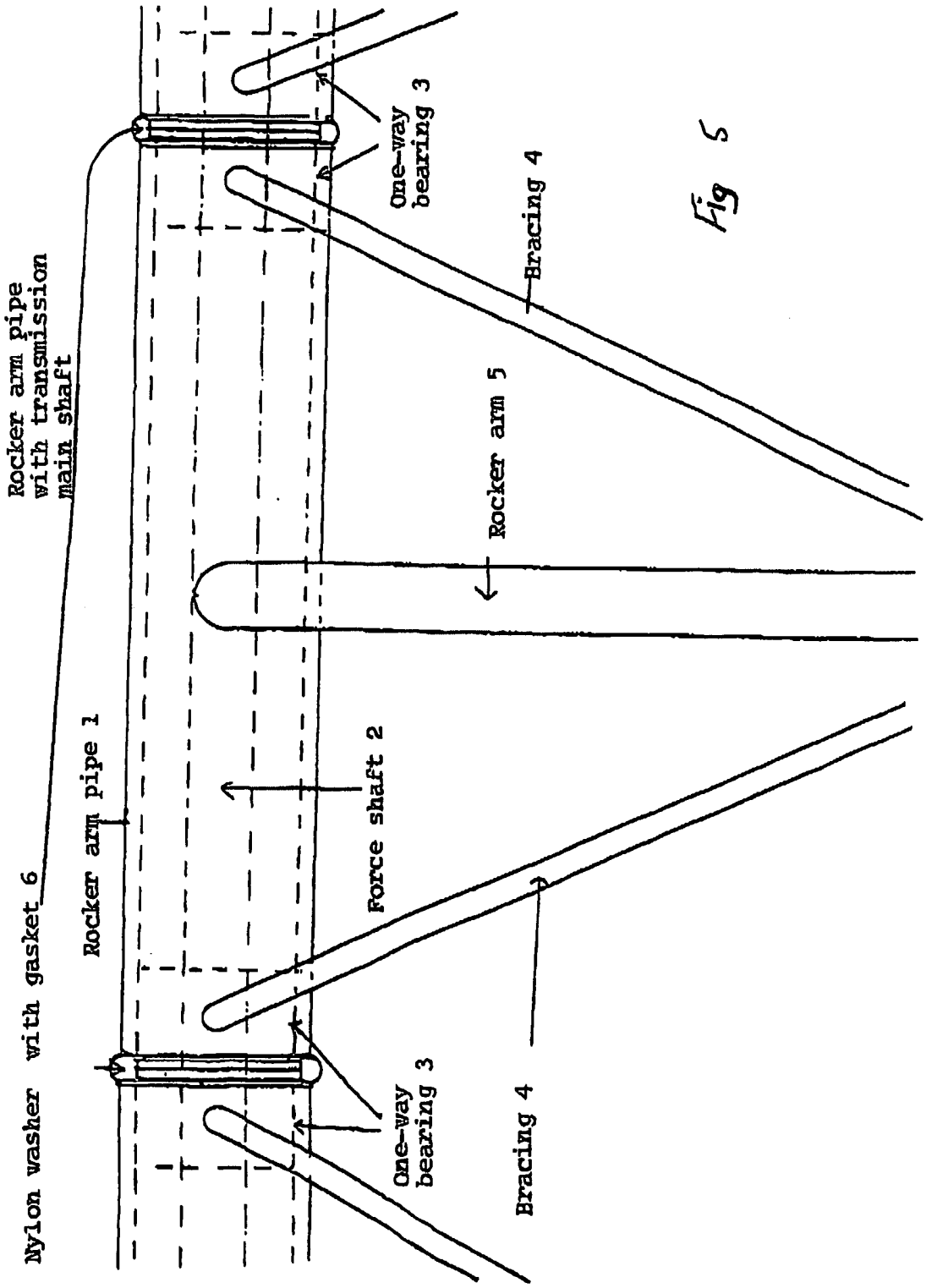

Rocker arm pipe
with transmission
main shaft
One-way
bearing 3
Bracing 4
Rocker arm 5
Nylon washer with gasket 6
Rocker arm pipe 1
Force shaft 2
One-way
bearing 3
Bracing 4

Fig 5

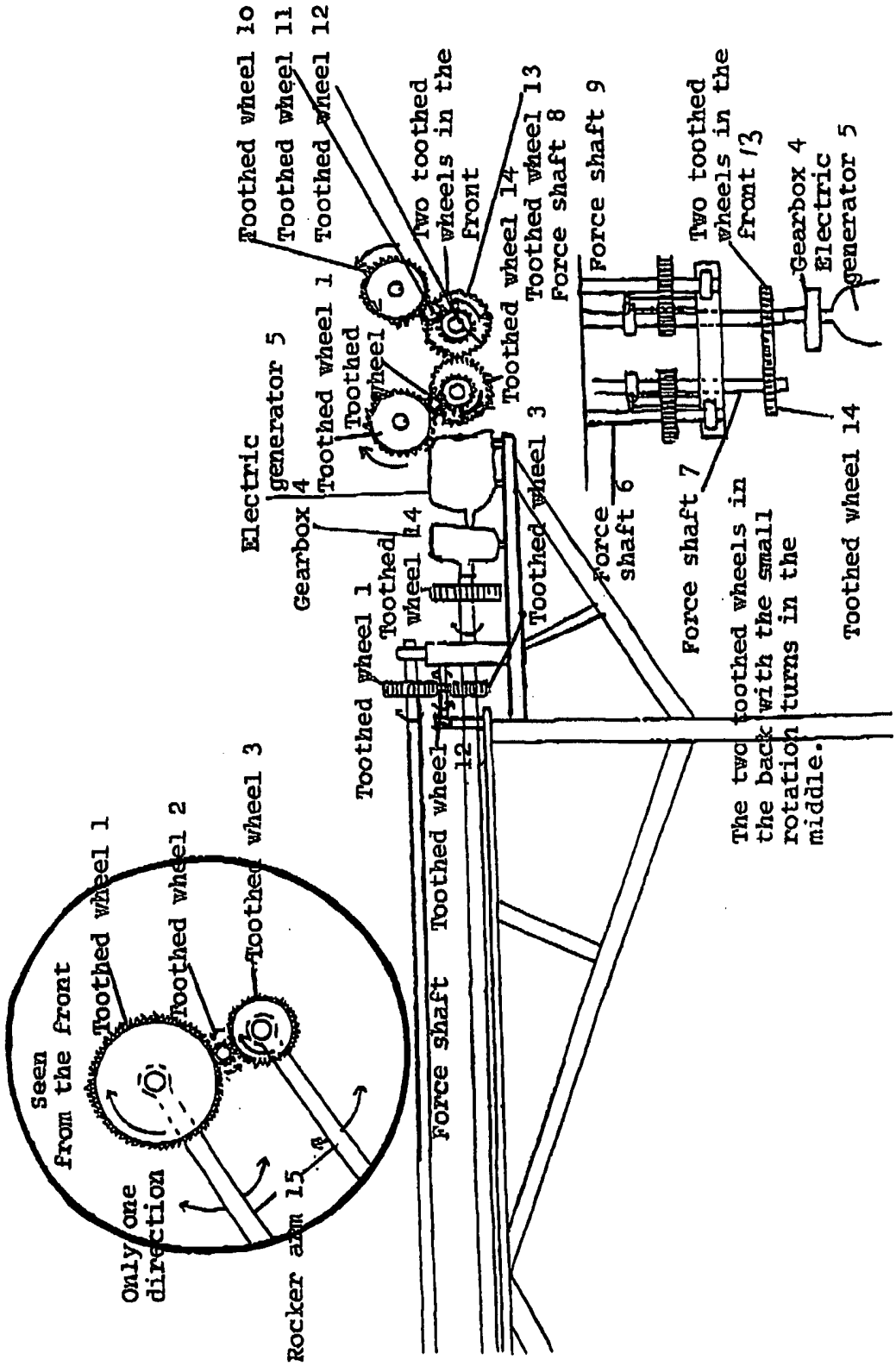

Seen from the front
Toothed wheel 1
Toothed wheel 2
Toothed wheel 3
Only one direction
Rocker arm 15
Force shaft
Toothed wheel 12
Toothed wheel 1
Toothed wheel 14
Gearbox
Electric generator 5
Toothed wheel 1
Toothed wheel
Toothed wheel 10
Toothed wheel 11
Toothed wheel 12
Two toothed wheels in the front
Toothed wheel 14
Toothed wheel 3
Toothed wheel 13
Force shaft 8
Force shaft 9
Force shaft 6
Force shaft 7
Two toothed wheels in the front 13
Gearbox 4
Electric generator 5
Toothed wheel 14
The two toothed wheels in the back with the small rotation turns in the middle.

Fig 7

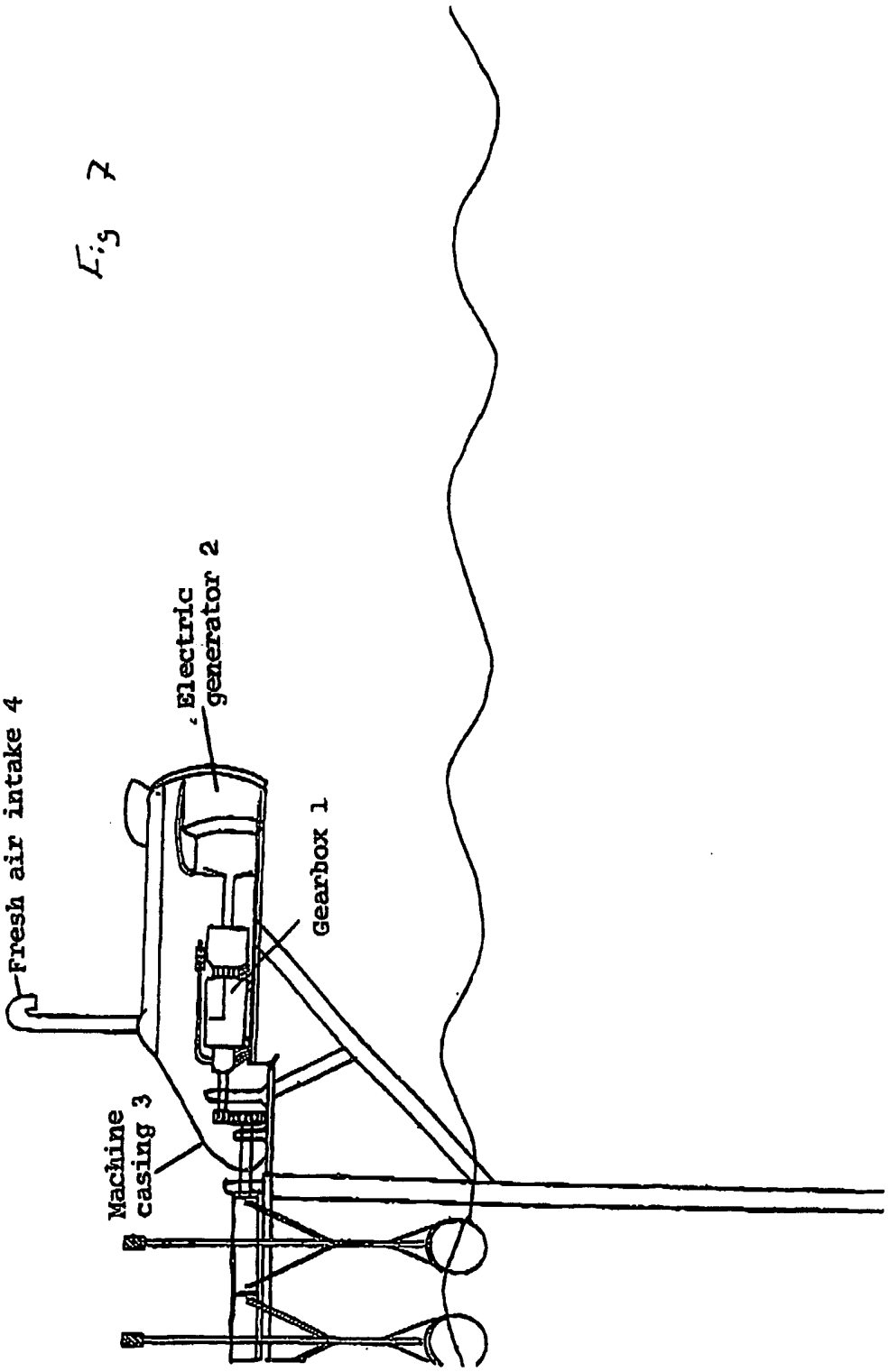
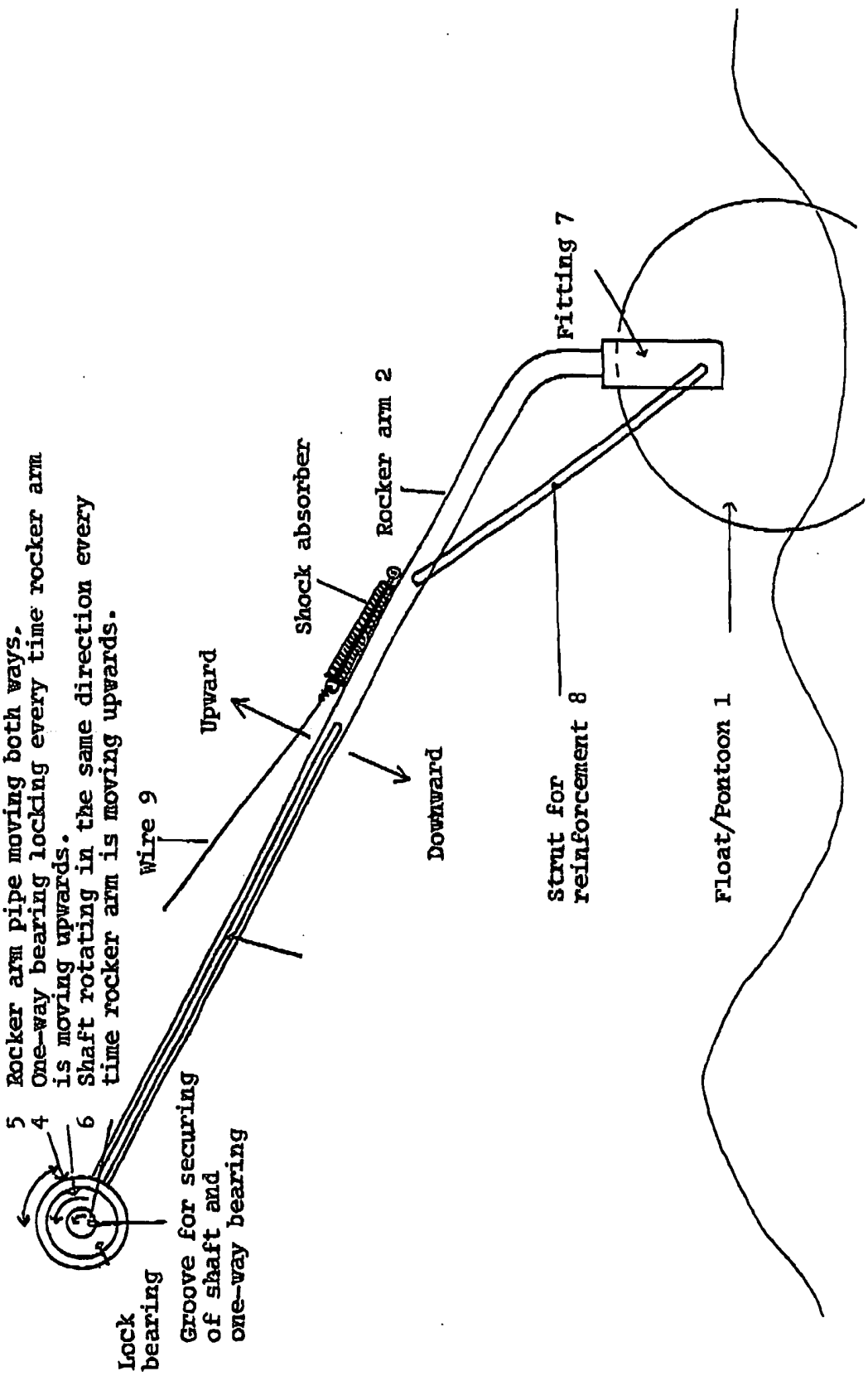

Fresh air intake 4
Electric generator 2
Gearbox 1
Machine casing 3

Fig 8

Seen from one end



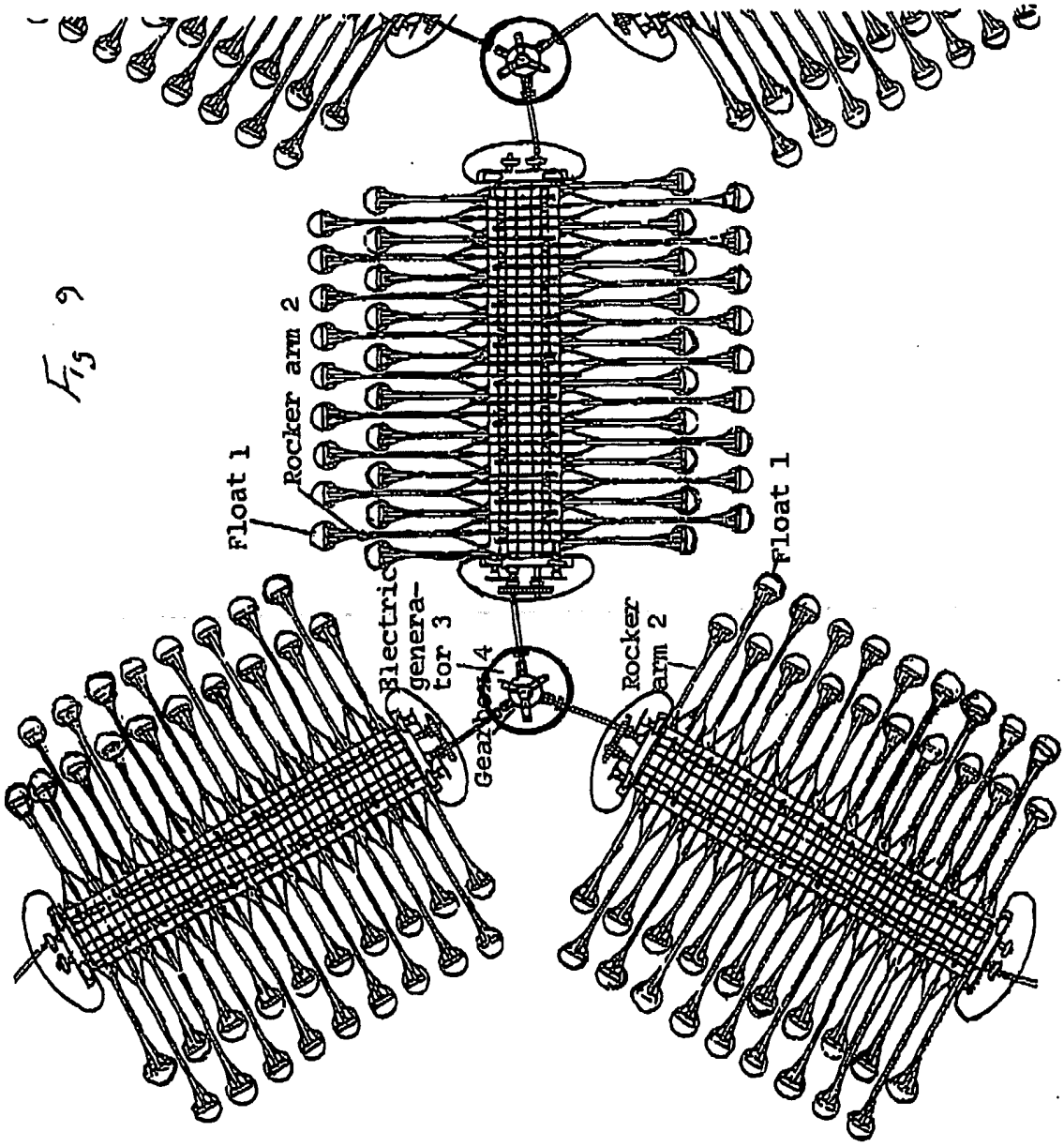

Float 1
Rocker arm 2
Electric genera- tor 3
Gear box 4
Rocker arm 2
Float 1

Fig 9

Fig 1o

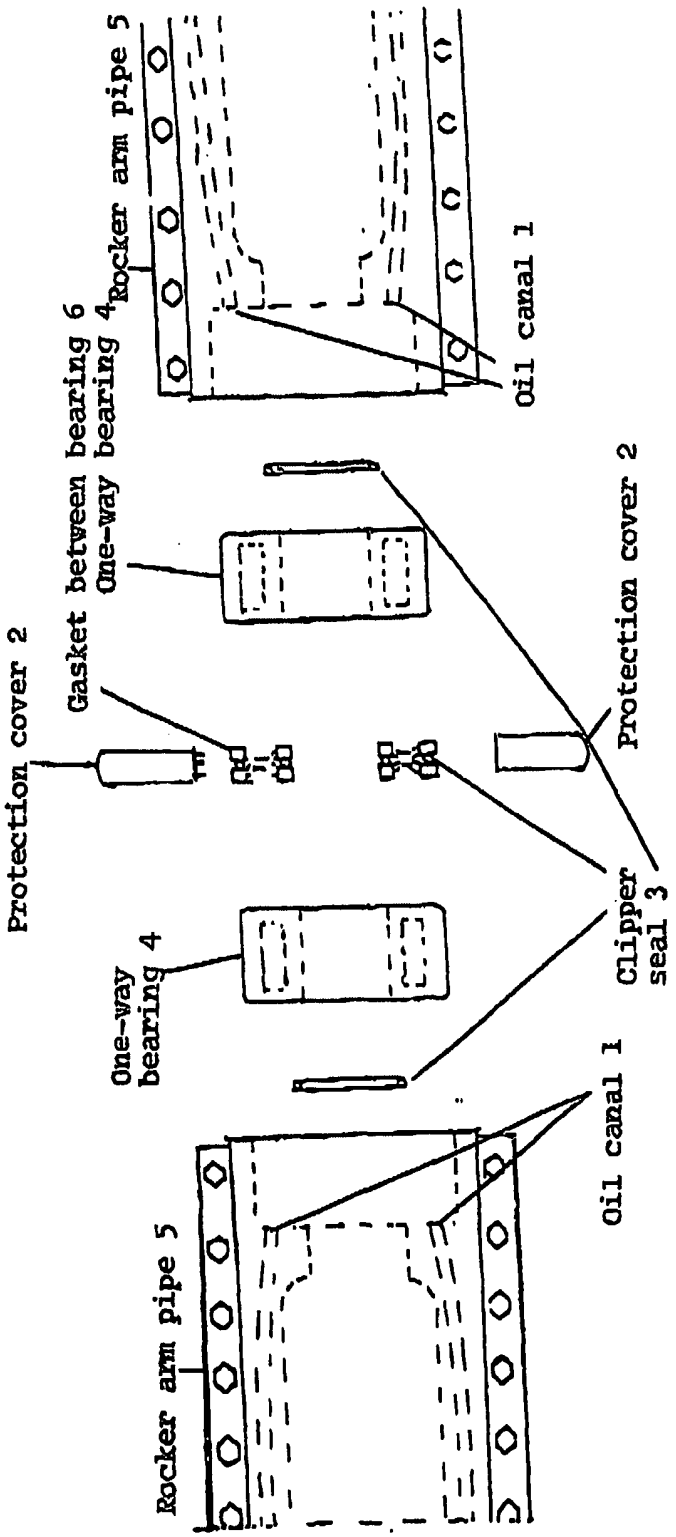
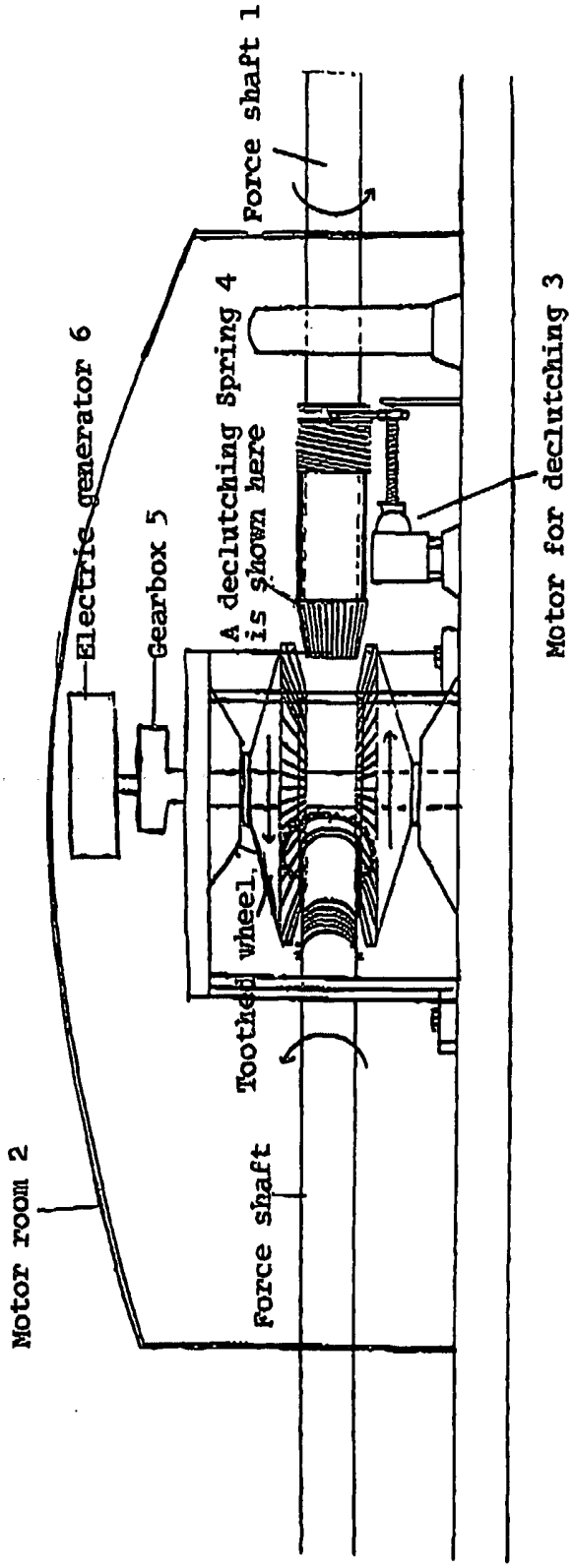

Rocker arm pipe 5
Oil canal 1
Protection cover 2
One-way bearing 4
Gasket between bearing 6
One-way bearing 4
Clipper seal 3
Protection cover 2
Oil canal 1
Rocker arm pipe 5

Fig 11


Force shaft 1
Electric generator 6
Gearbox 5
A declutching Spring 4 is shown here
Motor for declutching 3
Toothed wheel
Motor room 2
Force shaft

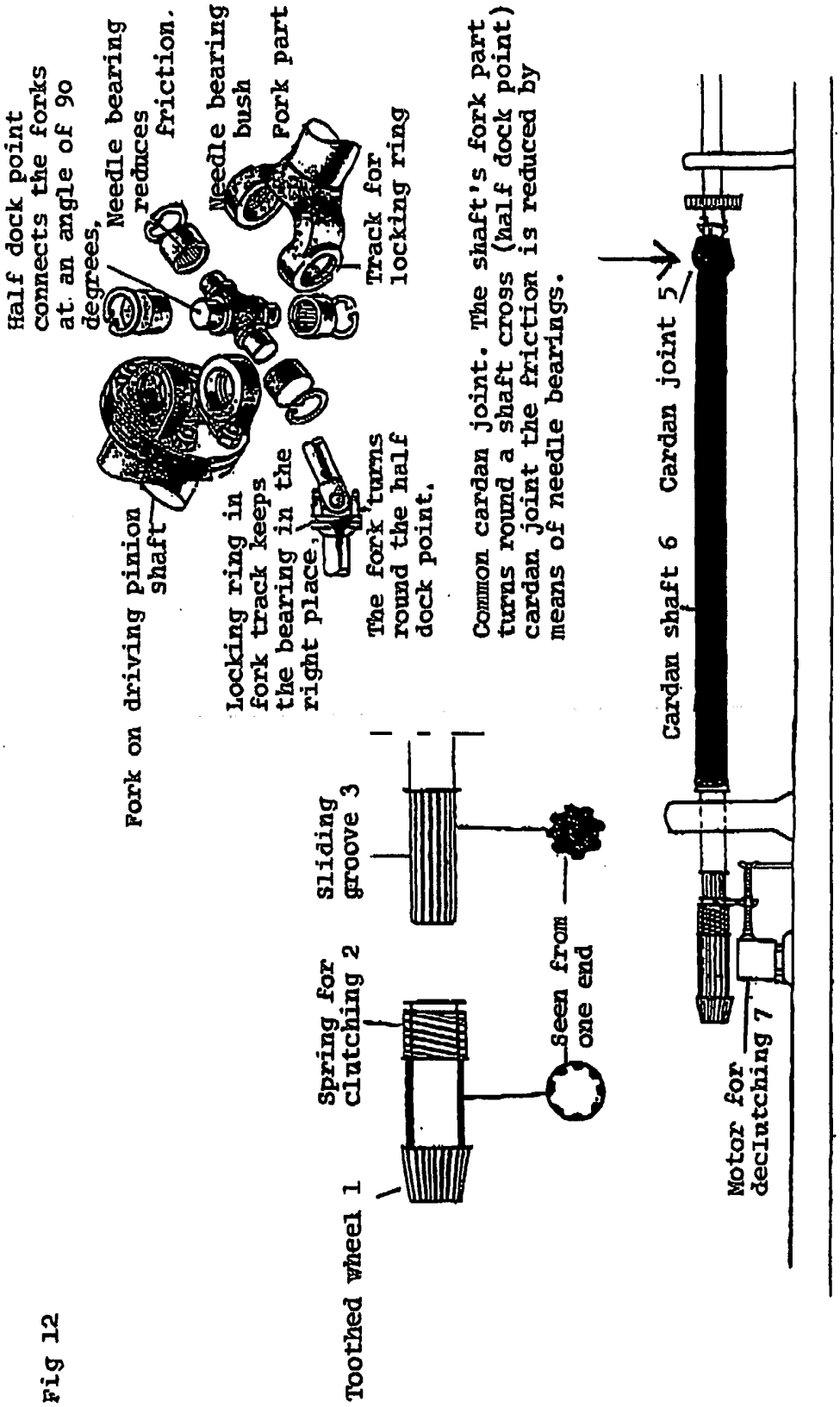

Half dock point connects the forks at an angle of 90 degrees.
Needle bearing reduces friction.
Needle bearing bush
Fork part
Track for locking ring
Fork on driving pinion shaft
Locking ring in fork track keeps the bearing in the right place.
The fork turns round the half dock point.
Common cardan joint. The shaft's fork part turns round a shaft cross (half dock point) cardan joint the friction is reduced by means of needle bearings.
Sliding groove 3
Spring for clutching 2
Toothed wheel 1
Seen from one end
Cardan shaft 6
Cardan joint 5
Motor for declutching 7

Fig 12

Fig 13

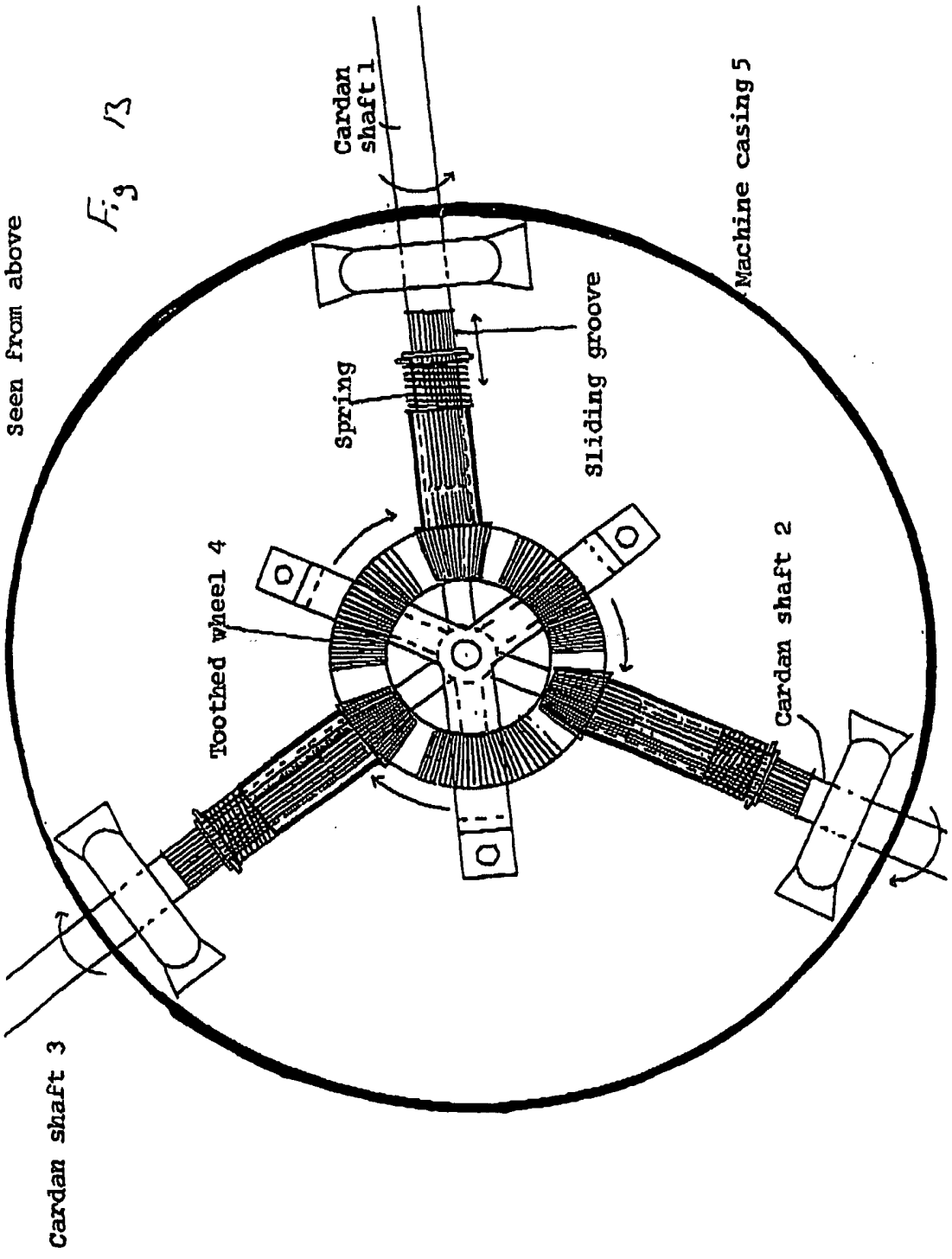

Seen from above
Cardan shaft 1
Machine casing 5
Spring
Sliding groove
Toothed wheel 4
Cardan shaft 2
Cardan shaft 3

Fig. 14

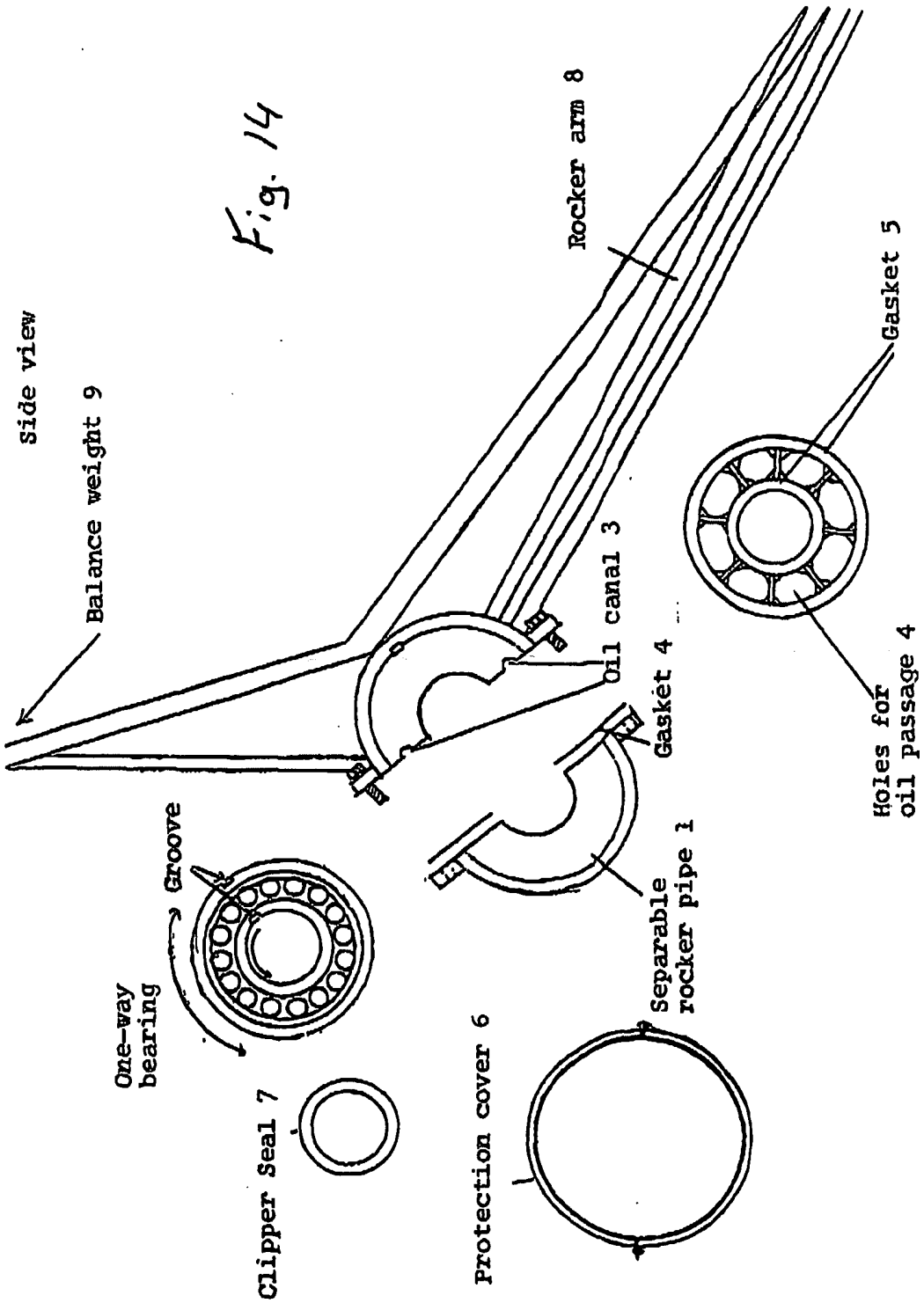

Side view
Balance weight 9
Rocker arm 8
Gasket 5
Oil canal 3
Gasket 4
Holes for oil passage 4
Groove
One-way bearing
Separable rocker pipe 1
Clipper Seal 7
Protection cover 6

Fig 15

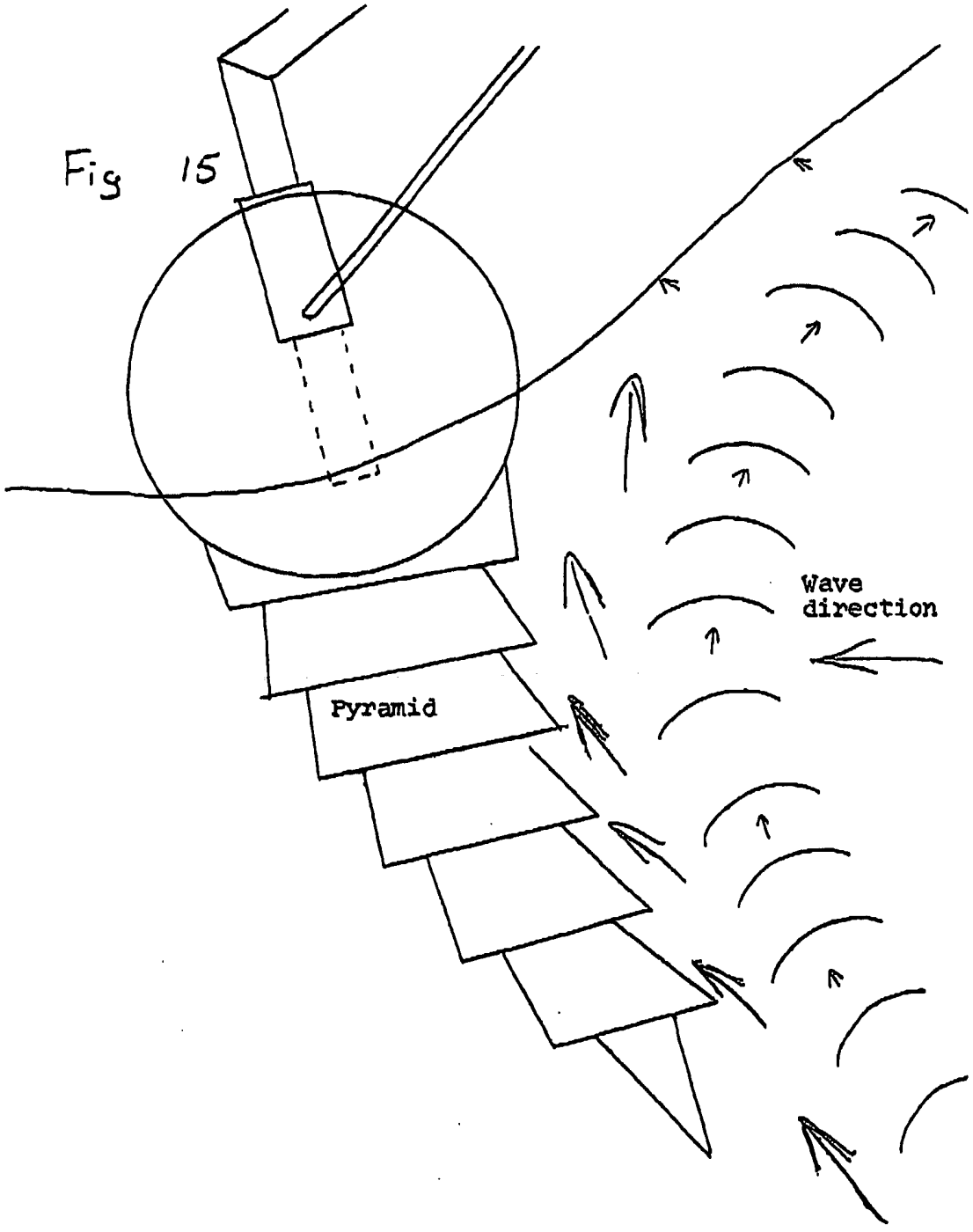
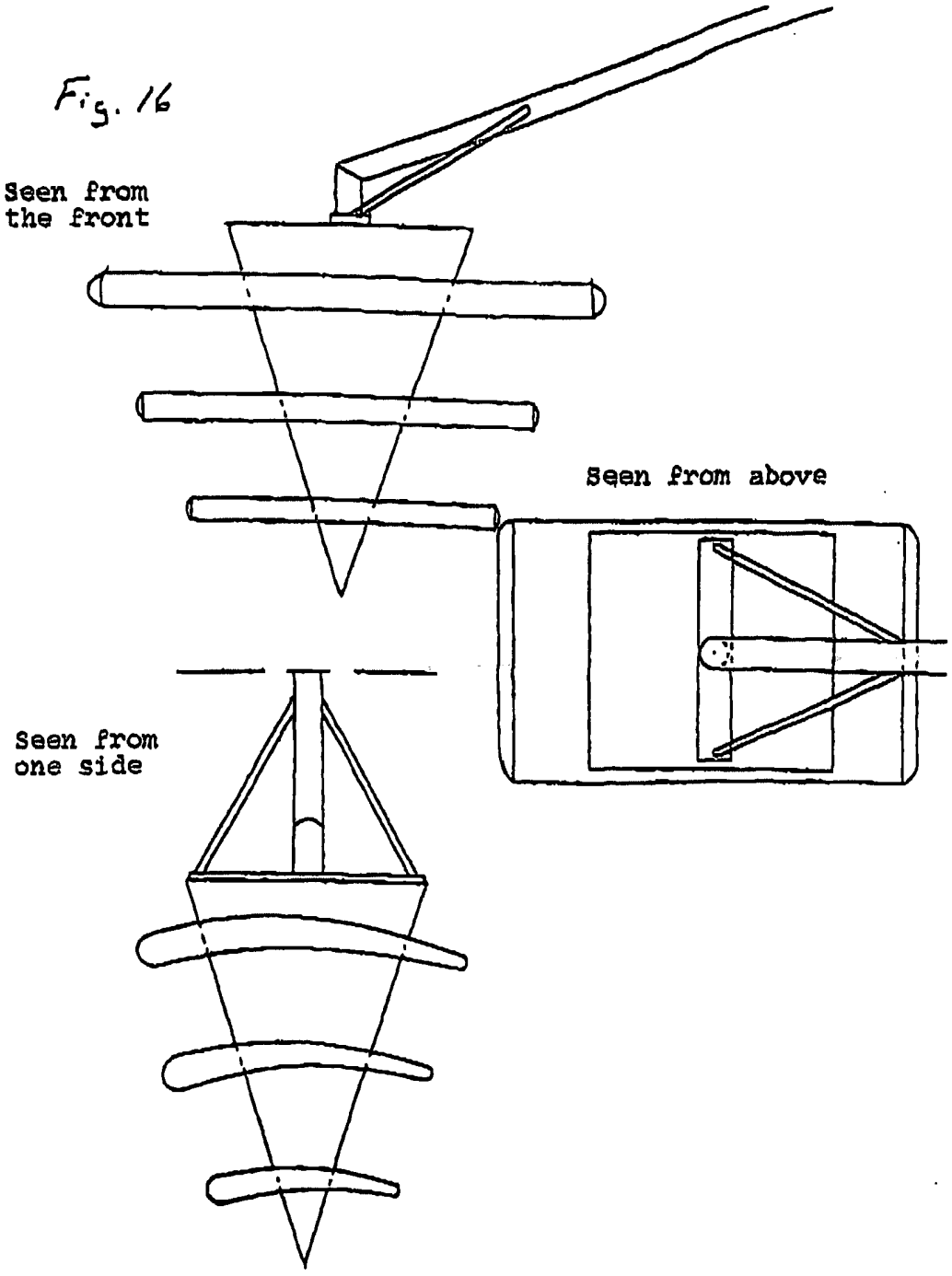


Fig. 16



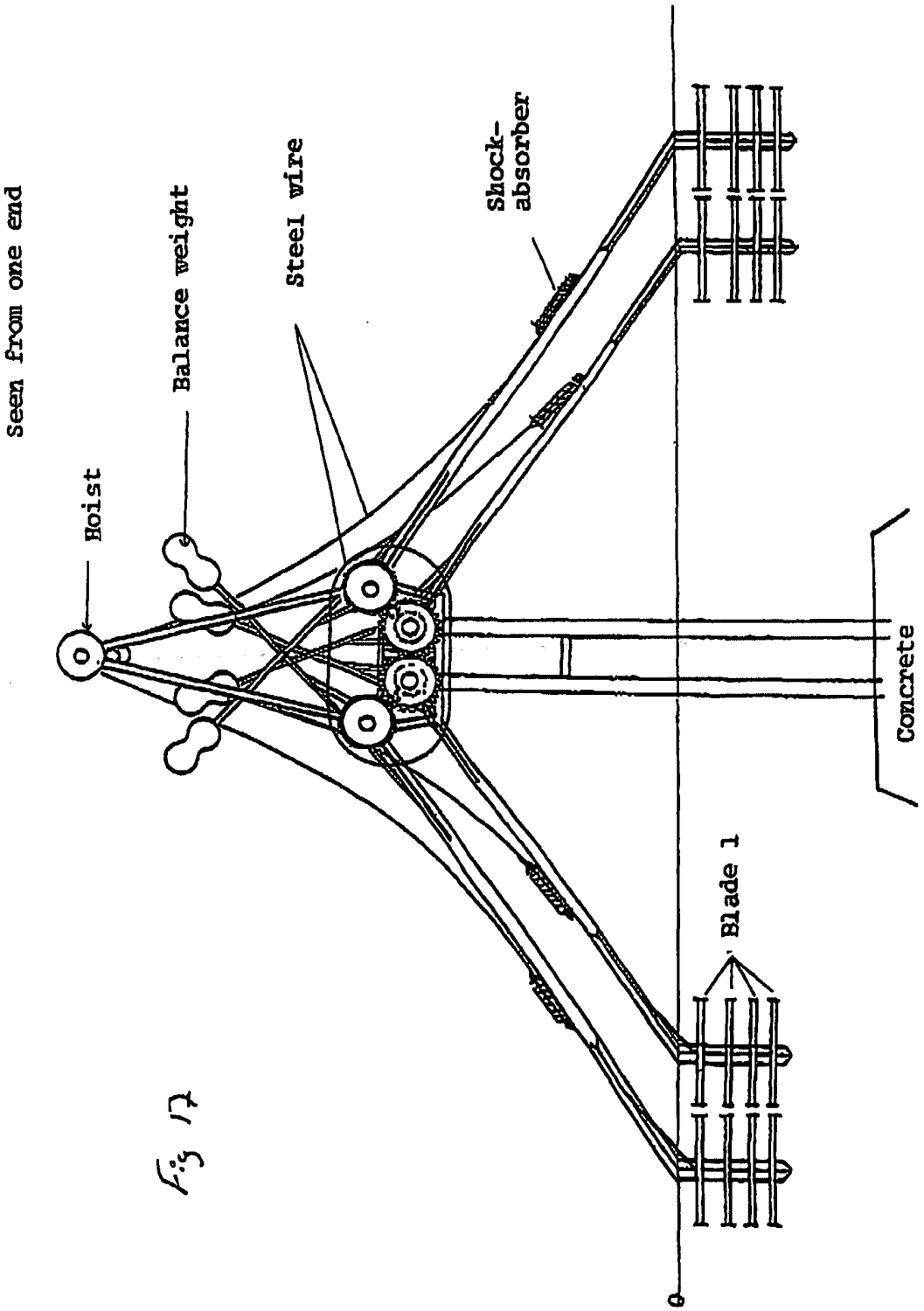

Seen from one end
Hoist
Balance weight
Steel wire
Shock-absorber
Concrete
Blade 1

Fig 12

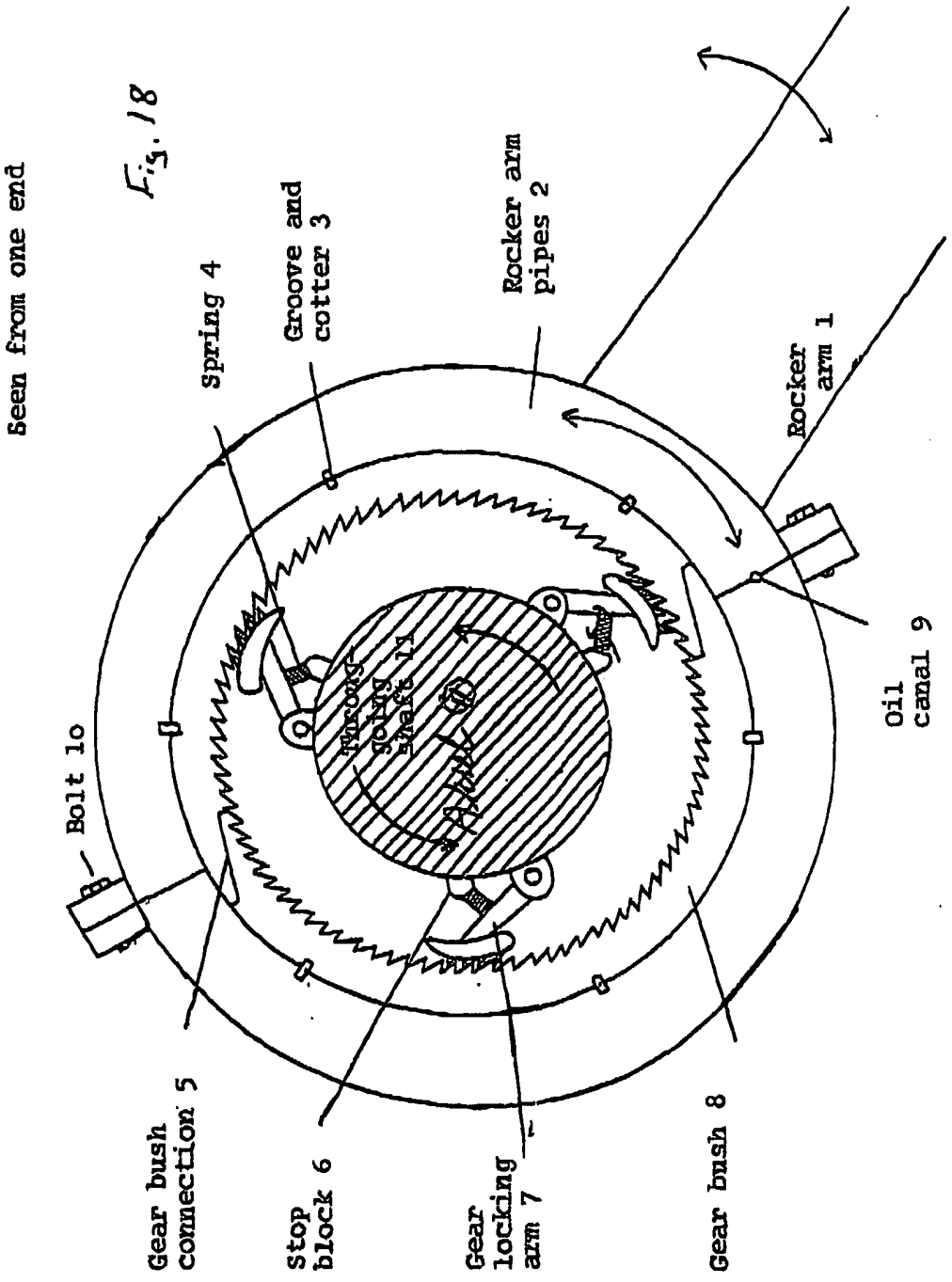
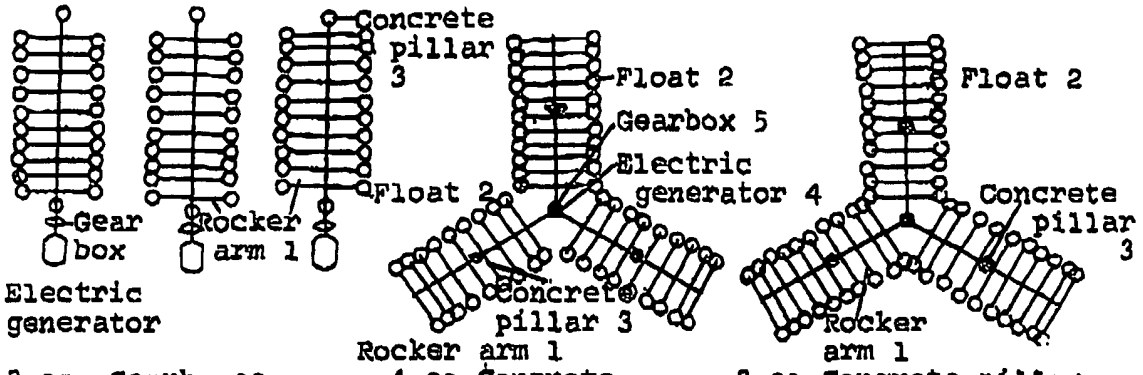

Seen from one end
Spring 4
Groove and cotter 3
Rocker arm pipes 2
Rocker arm 1
Bolt 10
Oil canal 9
Gear bush connection 5
Stop block 6
Gear locking arm 7
Gear bush 8

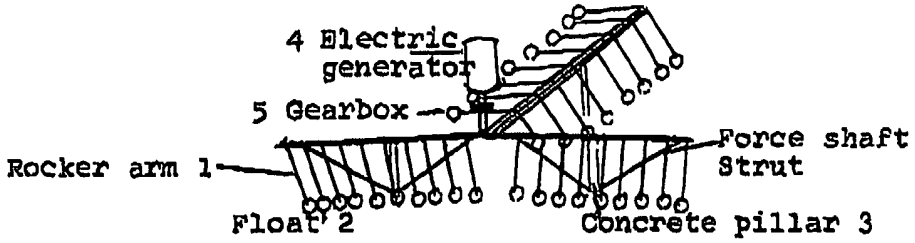
Fig. 18

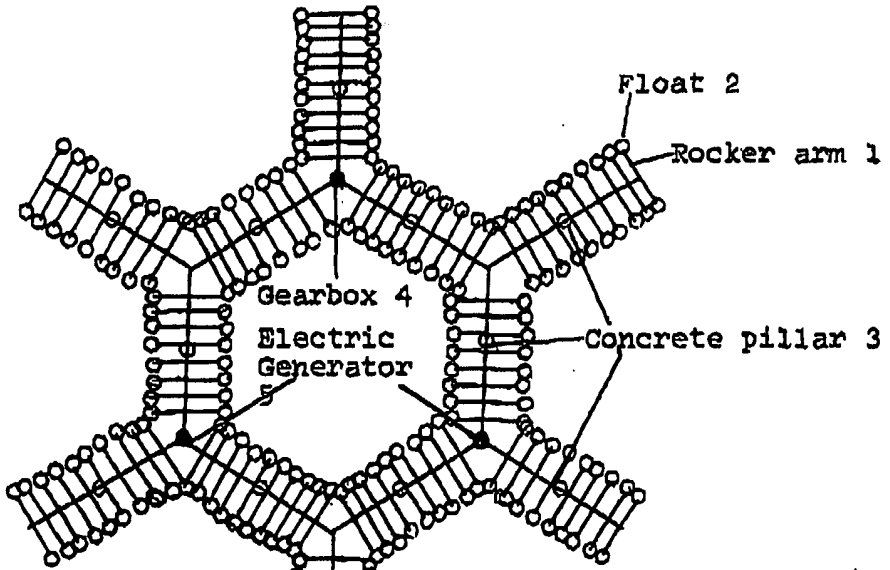


3 ea Gearboxes
3 ea Electric generators
6 ea Concrete pillars

4 ea Concrete pillars
1 ea Gearboxes
1 ea Electric generators

3 ea Concrete pillars
1 ea Gearbox
1 ea Electric generators

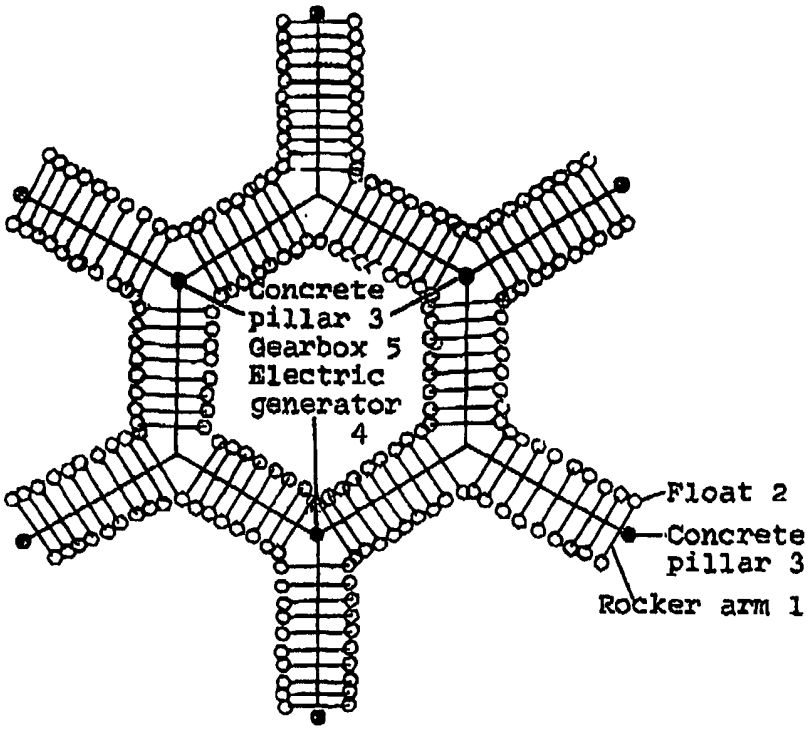




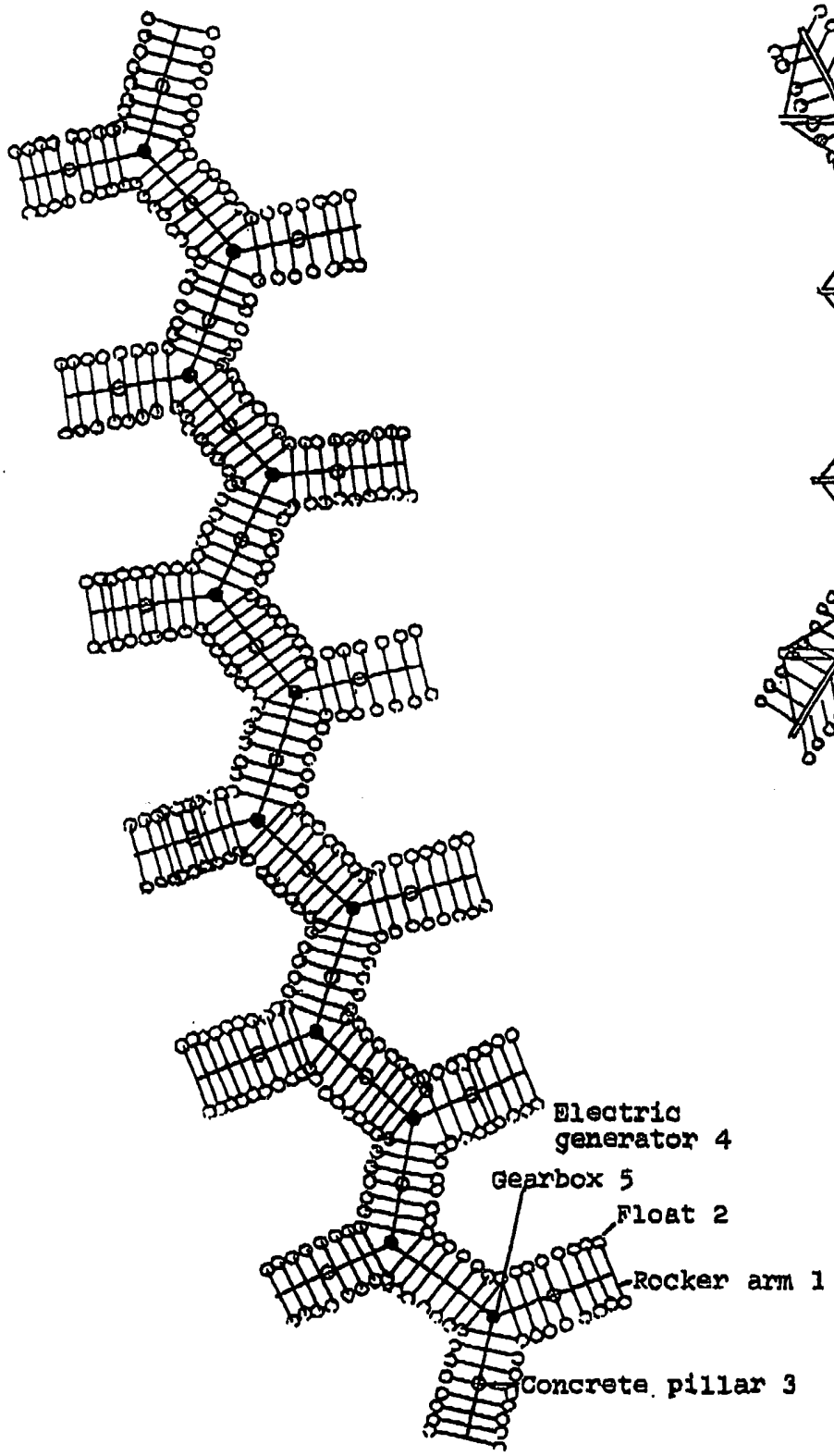
12 ea Wave force machines
12 ea Concrete pillars
3 ea Gear boxes
3 ea Electric generators

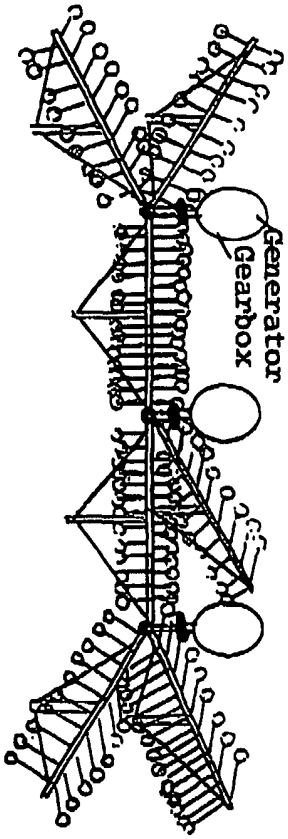
or

12 ea Wave force machines
12 ea Concrete pillars
1 ea Gearboxes
1 ea Electric generators



12 ea Wave force machines
9 ea Concrete pillars
3 ea Gearboxes
3 ea Electric generators





In principle several wave force machines can be interconnected to form any possible combination

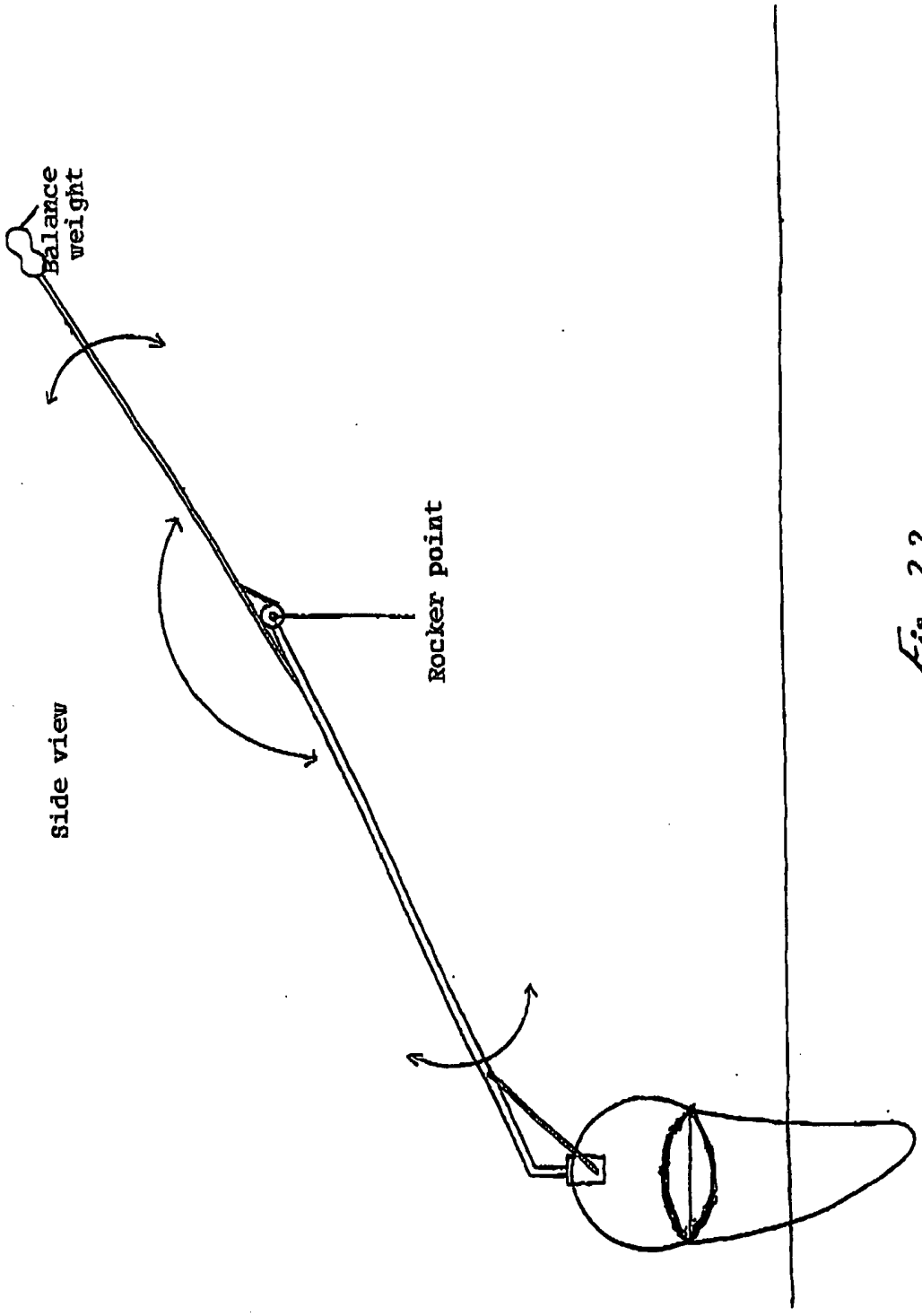


Fig. 22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 01/00317

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E02B 9/08, F03B 13/12
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E02B, F03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2075470 A1 (THIBAULT, MAURICE), 7 February 1994 (07.02.94)	1
A		2-12
	--	
A	DE 4338103 A1 (KLEMM, WOLF), 11 May 1995 (11.05.95)	1-12
	--	
A	DE 19515138 A1 (FEDDER, MARCUS, DR.), 31 October 1996 (31.10.96)	1-12
	--	
A	FR 2436888 A2 (FERONE GABRIEL ET AL), 18 April 1980 (18.04.80)	1-12
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 August 2001	08 -08- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Åke Olofsson/LS Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 01/00317

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2700874 A (RAMON DAURA ROURE), 1 February 1955 (01.02.55) -- --------	1-12

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/07/01

International application No.
PCT/DK 01/00317

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 2075470 A1	07/02/94	NONE	
DE 4338103 A1	11/05/95	NONE	
DE 19515138 A1	31/10/96	NONE	
FR 2436888 A2	18/04/80	EP 0001730 A	02/05/79
		JP 54089142 A	14/07/79
		US 4453894 A	12/06/84
US 2700874 A	01/02/55	NONE	